421.4

PROGRESS REPORT

ON THE

ASHLAND CONFERENCE PLAN PROJECTS.

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Summarizing Statement.

The Kaweah control project, funds for which were provided by the Sequoia National Park and the Forest Service, is the first project under the Ashland Conference Plan. Control work was carried on in April and May, 1918, at a total cost of approximately $1600, according to methods which had the full approval of the Bureau of Entomology. The collection of the necessary investigative data during the control work, and the subsequent check made in the fall of 1918, was also in accordance with approved procedure.

The unit is located in the Sequoia National Park and Sequoia National Forest, and has an acreage of 24,000 acres, of which only 10,200 acres consist of yellow pine- sugar pine timber. The estimated yellow pine and sugar pine on these 10,200 acres is estimated as follows:

Yellow pine-- 89,500,000 board feet.
Sugar pine -- 100,000,000 board feet.

The chief purpose of this investigative project, aside from its value in protection of the sugar pine and yellow pine timber on the area from future depredations by Dendroctonus species, is, in the words of the Ashland Conference Plan, "to determine the effectiveness of a given percentage and the proper method of application of such a percentage." Primary consideration on the Kaweah area was given the removal of the yellow pine infestation. The work done on the infested sugar pine has only a secondary investigative value because of the low percentage of infested sugar pine which it was possible to remove because of the shortage of labor and the extreme difficulty of access of a portion of the heaviest sugar pine attacks. Owing to the difficulties just mentioned, no control work at all was done on an area of about 4000 acres comprising the south-western part of the unit.

Of the 352,000 board feet of infested yellow pine on the entire unit, 210,000 feet, or approximately 60% of the infested timber was removed. Of the 396,000 feet of infested sugar pine on the area at the time of control work in the spring of 1918, 169,000 feet or about 43% of the total was treated. If the unworked portion of the unit (and this portion amounts to 40% of the entire Kaweah unit) is thrown out of consideration in the percentages, about 86% of the yellow pine infestation and 67% of the infested sugar pine was removed on the area actually covered by control work. No further control work on the unit is contemplated for investigative purposes.

It is the purpose to continue annual examinations on the Kaweah unit, and watch the result of the application of these percentages, both in the yellow pine and sugar pine timber. In addition, check areas adjacent to the Kaweah will be studied in order to give an indication of

what the progress of the Kaweah infestation might have been in the absence of control work. A few years must elapse before definite conclusions can be drawn on the effects of the Kaweah control operations.

For 1919 the following Ashland Conference Plan work is recommended:

1. The re-examination of the Kaweah project and appurtenant check areas.
2. The inauguration of control work in the Kings River Canyon, the project to serve as an Area B under the Ashland Conference Plan, namely, " to determine the extent of a sphere of influence, or what constitutes an infestation unit best suited for control operations." For this control work on the Sequoia National Forest, an allotment of $1200 during the present fiscal year, and a fund of $400 to be made available at the beginning of the next fiscal year, is recommended.
3. An endeavor during the coming field season on the part of Forest Examiner, A. J. Jaenicke, to locate active monticolae infestation in yellow pine-lodgepole stands in District Six, which are suitable as Ashland Conference Plan projects, in addition to being justified as protection projects.

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MAP OF KAWEAH UNIT AND SURROUNDING INFESTATION

MAP OF KAWEAH UNIT SHOWING INFESTED AND ABANDONED TREES OF ALL CLASSES.

Object.

The Kaweah insect control project carried out in the spring of 1918 was agreed upon in the latter part of 1917 by the Bureau of Entomology and the Forest Service as satisfactory as an area A under the Ashland Conference Plan. In the words of this plan, the purpose of such an area was " to determine the effectiveness of a given percentage and the proper method of application of such a percentage."

The above has reference on this particular area to only the D. brevicomis infestation in yellow pine. On this area there was considerable loss by insects in the heavy sugar pine stands. The shortage of labor and transportation difficulties made it impossible to thoroughly clean up the sugar pine infestation, but since the main purpose of the project, aside from its investigative value, was the protection of the sugar and yellow pine stands from further depredations by bark beetles, as much attention was given the sugar pine infestation as was possible with the restrictions imposed by labor shortage and transportation difficulties. Therefore, the relatively low proportion of infested sugar pine which it was possible to remove decidedly lowered the value of the sugar pine control work from the investigative standpoint.

Briefly then the chief investigative value of this project is the study of the method of application and effect of a given percentage of a D. brevicomis infestation in yellow pine. The treatment of the sugar pine on this project has a much lesser investigative value.

Description of the Area and its Timber.

The area corresponds to unit 10 of the 1917 California Insect Survey and is located in the Sequoia National Forest and the Sequoia National Park. The total area of the unit is 24,000 acres, but only 10,200 acres of the true yellow pine- sugar pine type occur within its confines. The remaining portion, or 13,800 acres, consists largely of lodgepole, isolated Jeffrey pine stands, red and white fir, and brush, and serves mainly to further isolate the yellow pine- sugar pine stands from the pine timber outside of this infestation unit.

The 10,200 acres of yellow pine- sugar pine under consideration were divided by ownership, as follows:

	Acres
Sequoia National Park	7700
Sequoia National Forest	2500

The accompanying type map shows the actual distribution of this stand.

By legal subdivisions, the area includes portions of the following sections:

National Park.

T. 15 S. R. 30 E.

Sections 33, 34, 35 and 36.

T. 16 S. R. 30 E.

Sections 1, 2, 3 and 4, 8, 9, 10, 11, 12, 13, 14, 15, 22, 23, 24, 25, 26, 28 and 33.

T. 16 S. R. 31 E.

Sections 6, 7, 18, 19 and 30.

National Forest.

T. 16 S. R. 31 E.

Sections 6, 7, 8, 16, 17, 18, 19, 20, 29 and 30.

These 10,200 acres of yellow pine and sugar pine are effectively separated from similar timber by wide areas of brush and extensive belts of other species of timber, as well as by high topographic barriers. The infestation under consideration is therefore effectively isolated from similar insect depredations. The Kaweah project includes most of the yellow and sugar pine timber in the upper drainage of the Middle Fork of the Kaweah river.

Most of the pine timber is located between the 4000 and the 7500 foot contours, the yellow pine occurring largely on the south slopes and the sugar pine on the north slopes. The entire unit is characterized by steep slopes and deep canyons. In fact the rough topography of the unit is the main factor in the relatively high cost of control work. The map of the project, on which only 500 foot contours have been placed, indicates this very clearly. Topography of this kind makes it easy to view the country for the purpose of roughly estimating an existing infestation, but from the standpoint of the cost of doing the actual control work and the subsequent checking it is decidedly objectionable. In choosing future investigative projects, the matter of topography will be given more serious consideration.

The yellow pine and sugar pine timber in this control unit is exceptionally thrifty and of rapid growth. Soil and moisture conditions are particularly favorable for attainment of tall timber of large diameters. In the better part of the yellow pine stands the average mature yellow pine

has a diameter in excess of 32 inches D.B.H., and a volume of almost 2500 board feet. In the case of the mature sugar pine the average breast high diameter is well over 39 inches and the volume over 4000 feet. These figures indicate the high degree of development which pine frequently reaches in the upper Kaweah drainage. Mistletoe is present to some extent in both species, but it is not regarded here as a serious menace.

No reconnaissance estimates are available for this project, but all portions of it were so thoroughly gone over at the time of the control work and the subsequent check in the spring and fall of 1918 by Messrs. Miller, Hopping and Jaenicke, that it is believed that an estimate sufficiently accurate for insect control purposes has been arrived at. This estimate is as follows:*

Yellow pine	89,500,000 board feet
Sugar pine	100,000,000 " "

For the unit of 10,200 acres, this corresponds to a per acre stand of 18.5 M, of which almost 10 M is yellow pine and over 8.5 M is sugar pine. The timber is by no means evenly distributed over the whole unit. In general, over two-thirds of the yellow pine occurs on the 5000 acres on the north side of the Kaweah river, while three-fourths of the sugar pine occurs on the 5000 acres on the south side of the Kaweah.

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* This estimate is considerably below that given in the 1917 California Insect Survey report for unit 10. The estimate given in that report includes the scattered yellow pine and sugar pine occurring on the 14,000 acres outside of the heavy stand of 10,000 acres of these species, as well as the Jeffrey pine on the high slopes. In addition, the careful cruising of the unit during 1918 indicated that the original estimate even for these heavy stands was somewhat too high.

Status of Infestation at Time of Control Work.

The following table indicates the status of the Kaweah infestation at the time of the control work, as determined from actual records of trees marked and spotted on the area. In the determination of annual loss, trees which were attacked in the spring or summer of 1917 and abandoned before fall are classed in the 1917 loss. In addition trees which were attacked in the late summer or fall of 1917 and in which the insects did not emerge until the following spring, are considered a part of the 1917 loss. The same general procedure will be followed in determining annual loss on the Kaweah area and check areas. Only the 1917 figures are complete in the following table, as will be explained in the next paragraph.

1916 and 1917 Losses on the Kaweah.

Year	Yellow Pine		Sugar Pine	
	No. of trees	Board feet	No. of trees	Board feet
1916	65	125,240	26	69,310
1917	344	610,150	123	402,150

The 1916 figures in the preceding table are those obtained as a result of an actual cruise, but this cruise did not include the trees attacked earlier than the fall of 1916, and therefore trees which were attacked in the spring and abandoned in the summer of 1916 must be estimated. It is pretty well established, however, that these early generation trees may equal 50 to

100% of the volume of the over wintering trees. Allowing 75% as an average figure, the 1916 losses in the previous table are arbitrarily raised in the following table in order to put the 1916 and 1917 figures on a fair comparative basis.

1916 and 1917 Losses on the Kaweah.

(1916 Loss Augmented)

Year	Yellow Pine		Sugar Pine	
	No. of trees	Board feet	No. of trees	Board feet
1916	103	218,340	44	121,290
1917	244	610,150	123	402,130

Between 1916 and 1917, therefore, there was an increase in the infested yellow pine volume amounting to 180% and an increase of 230% in the sugar pine volume. Not until the examination in the spring of 1919 will the insect loss estimate for 1918 be complete. The incomplete 1919 figures are given in the section entitled, "Results of Inspection Subsequent to Control Work."

Analysis of Infestation at Time of Control Work.

On April 1, 1918, the beginning of the control work on the Kaweah unit, the following infested volumes of yellow pine and sugar pine were present on the area:

Infested Volumes.

	Yellow Pine	Sugar Pine
No. of infested trees	141	113
Volume of infested trees (board feet)	352,280	395,855
Average volume per tree	2,500	3,500

D. brevicomis was responsible for practically all of the primary infestation in the yellow pine, while D. monticolae was the only important infesting insect in sugar pine. The prevalence of secondary insects in the trees killed by Dendroctonus will be described in a supplementary report to be prepared by the Bureau of Entomology.

This infestation was quite regularly distributed throughout the control unit, except that most of the yellow pine attacks occurred in the north half of the project area, while the bulk of the infested sugar pine timber was found in the south half of the unit. For a graphic representation of this distribution the reader is referred to the attached map of the unit on which the various classes of infested and abandoned trees have been placed.

Over 70% of the infested yellow pine volume occurred in the form of scattered individual trees. The remaining 30% of the infested volume was found in groups of trees containing from 2 to 5 trees per group. The

following tabulation summarizes this condition in the 141 infested yellow pine on the unit.

Yellow Pine Distribution.

Distribution	Number of Trees	Board Feet
Standing Alone	87	251,620
Groups of 2- 4	54	100,660

In the case of the infested sugar pine, even a larger percentage of the infestation is in the form of separated individual trees. Less than 20% of the infested trees occur as groups, and these groups are in no case larger than four trees.

Sugar Pine Distribution.

Distribution	Number of Trees	Board Feet
Standing Alone	79	518,125
Groups of 2- 4	54	77,710

In order to indicate what difficulties arise in the choice of the trees on a control project in California which warrant treatment, and to serve as a basis for comparing the volume and character of the trees actually treated with the total which occur on the unit, the infested timber is classified in the following paragraphs according to the character and amount of infestation in it.

The 141 infested yellow pines occurring on the unit can be classified

roughly as follows:

1. Trees containing full broods of brevicomis.

2. Trees partially abandoned by brevicomis.

3. Top-killed trees, trees which show no indication of infestation from a basal examination, although entire foliage was fading and a few small trees killed by monticolae.

Inasmuch as only 87 of the 141 yellow pines were actually treated, and since some of the untreated trees were not seen, except at long range, it is impossible to state exactly what proportion of the infested yellow pine volume comes under each of these three classes. In the application of control work, however, a number of trees belonging to classes 2 and 3 were felled and examined in order to determine as well as possible the character of the infestation in the doubtful and partially abandoned trees left standing on the area. With this as a basis the percentage of each class is estimated as follows:

Class 1. Trees containing full broods— 70%

Class 2. Trees partially abandoned— 15%

Class 3. Top-killed and miscellaneous— 15%

The infested sugar pine volume consisting of 113 trees can also be classified roughly in same general way:

Class 1. Trees containing full broods— 40%

Class 2. Trees partially abandoned- infested at base but from which the tops were abandoned the previous year— 45%

Class 3. Doubtful trees- green at base and infested at the top— 15%

The yellow pine and sugar pine infested by insects consisted largely of trees which were either still growing rapidly or were nearing maturity. In any case the attacked timber was of a thrifty character, and only in a very few cases either over-mature or decadent. The situation on this project area again clearly demonstrates the ability of Dendroctonus beetles to kill healthy timber in considerable volumes.

Administrative Data on the Control Work.

The area was worked jointly by the Sequoia National Park and the Forest Service during the period April 1- May 20, 1918.

The strictly administrative features of the work were taken care of by Forest Examiner O. M. Evans and Ranger Lloyd Allen of the Forest Service. The collection of all of the data of an investigative nature during the control work was under the direction of J. M. Miller of the Bureau of Entomology, assisted by Ralph Hopping of the Forest Service and Albert Wagner of the Bureau.

Owing to the high cost of subsistence, labor and transportation, and the difficulty of getting an adequate number of men to enable their division into fully manned crews, the cost of this control work was much higher than is usual under normal conditions. The exceedingly rough topography of the unit, and the widely scattered occurrence of the trees to be treated, were other factors which contributed to this high cost.

For the control work on the unit, the Sequoia National Park set aside an allotment of $1500, while the Forest Service provided a fund of $700. The relative amounts of these allotments were based on the proportionate amount of National Park and National Forest timber to be protected on this project. The cost* of the work was divided as follows:

Labor—	$1,169.87
Transportation—	359.38
Equipment—	51.85
	1580.60

* The men furnished their own subsistence. Experienced men were paid $3.50 per day, while $3.00 per day was paid for men without previous experience in control work.

Of this total amount $696.52 was charged against the National Park allotment and $684.08 against the Forest Service fund. The large balance of over $500 in the National Park allotment was due to the fact that the shortage of labor and the extreme difficulty with which certain infested sugar pine stands could be reached, necessitated the abandonment of part of the contemplated work on the Park.

The following tabulations summarize the more important figures connected with the actual control operations:

	Number of trees treated	Volume of trees treated.
Yellow Pine	87	209,580
Sugar Pine	45	169,020
Jeffrey Pine	3	4,100
Total--	135	382,700

Average volume and diameter of treated trees.

Species	D.B.H.	Volume
Yellow pine	31.3	2409
Sugar pine	38.2	3776
Jeffrey pine	42.8	4266
Average	34.4	2836

Cost data on treated trees.

Cost per average tree--	$11.88
Cost per M board feet--	4.15

Selection and Character of Trees Treated.

At the outset it may be stated that there were three classes of infested trees which were not cut, except accidentally or for investigative reasons. These classes are:

1. Inaccessible trees which were difficult to reach by the control crews. This class also includes those yellow pines and sugar pines on the south side of the Kaweah river, none of which were treated.

2. Trees with doubtful infestation, such as trees with slightly fading foliage but no infestation at the base.

3. Trees more than 50% abandoned.

Classified in this manner the 122 untreated yellow pines and sugar pines can be tabulated as follows:

Classification of Untreated Trees.
(Board feet volumes)

	Yellow Pine		Sugar Pine	
	No. of trees	Volume	No. of trees	Volume
Inaccessible	42	100,280	66	212,125
Doubtful	6	22,910	1	9,430
Nearly abandoned	5	19,410		
Trees missed	1	100	1	5,260
	54	142,700	68	226,815

Most of the timber in the "Inaccessible" class in the above table occurred in the unworked portion of the Kaweah unit. The exact proportion is as follows:

	No. of trees	Board feet
Yellow Pine	34	85,490
Sugar Pine	45	144,355

In order to make clear what proportion of the treated trees contained full broods, how many were partially abandoned, and just what proportion of the trees upon treatment were found to belong to what might be called the doubtful class, the following tables are presented:

Yellow Pine

	No. of trees	Volume (board feet)
Full broods*	67	144,000
Partially abandoned	10	54,000
Doubtful	10	32,000
Total treated—	87	210,000

In the 10 yellow pines of the "Partially abandoned" class in the above table, the average emergence of brevicomis amounted to only 50%; in some cases the emergence was as low as 10%, and in two others it proved to be as high as 90%. The yellow pines in the "Doubtful" class included top-killed trees, and also those which showed no indication of infestation from a basal examination, although the entire foliage was fading.

Sugar Pine

	No. of trees	Volume (board feet)
Full broods	29	72,000
Partially abandoned	12	72,000
Doubtful	4	25,000
Total treated—	45	169,000

The "Doubtful" trees in the sugar pine table just given were those which were green at the base and infested at the top. These were usually distinct top-killed trees. The "Partially abandoned" class consisted largely of sugar pine trees which were infested at the base and abandoned by the broods in the tops during the previous year.

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* With the exception of 6 trees with a total volume of 1220 board feet containing full broods of monticolae, all of these trees were killed by brevicomis.

Treatment of the Infested Trees.

The first felling of infested trees on this project was done in April 6 and the last on May 19, 1918. There were a number of differences in the treatment of yellow pine and that of sugar pine, and therefore the discussion of these two species will be covered in separate paragraphs.

In the case of the felled yellow pine, all of the infested bark was peeled and burned. In no case was the uninfested bark on the trunks and tops burned except incidentally. It was necessary to burn a considerable percentage of the slash in the early part of the work to assist in the burning of the bark. Only the bark of those stumps which contained D. brevicomis infestation was burned. Valens infestation in the stumps was not frequently encountered and was not burned.

In the infested sugar pines which were cut, the aim was to burn all infested bark which contained large numbers of new adults. Wherever there was a large proportion of larvae and pupae the bark was merely peeled. In exactly half of the sugar pines the bark was peeled and burned, and in the other one-half the bark was merely peeled. As in the treatment of the yellow pine, the slash was only burned when it was necessary for the proper burning of the bark. In one-half of the trees the tops were burned, and in the case of the other half, many of the tops were abandoned at the time of treatment. Uninfested trunks were left untreated. No attempt was made to peel those few sugar pine stumps which contained only Valens. Practically all of the stumps contained monticolae, and were therefore either peeled and burned or merely peeled as the presence or absence of new adults required.

Results of Inspection Subsequent to Control Work.

A definite system of designating different classes of treated and untreated yellow pines and sugar pines was evolved as a result of the control work on the Kaweah unit and the subsequent check during the spring and fall of 1918. This classification is equally applicable to control areas and check areas. Since it is the plan to use the same system in all future work, with such minor modifications as seem feasible from time to time, this classification is herewith given. The legend given in the attached map of the unit, and the manner in which the various classes of infested and abandoned trees has been placed on this map, corresponds exactly to this classification.

1. Plain number trees. Those insect-killed trees which were in an abandoned condition at the time of the control work in the spring of 1918.

2. A trees. Those which were in an infested condition at the time of the control work in the spring of 1918. These trees were attacked the previous fall and still contained the broods of the original infesting insects at the time of the control work. It was these trees on which the control work of the spring of 1918 was concentrated.

3. B trees. Those trees which were infested during 1918, but subsequent to the control work of the spring of 1918. (Trees attacked during 1919 will be called C trees, those attacked in 1920 D trees, etc.)

4. Top-killed trees of the foregoing classes. Trees in which the infestation was or is merely in the tops have not the same significance or importance in determining what trees are to be treated or in computing the insect losses, as trees which are infested to such an extent that they are dying. For this reason it is desirable to differentiate top-killed trees of the Plain Number, A, and B class.

5. Marked and spotted trees. All of the trees of the above mentioned classes were either blazed, numbered, and measured, or observed only from a distance. Some trees on the unit were so isolated and so difficult of access that it was not feasible to reach them. Such trees are known as spotted trees, while those of the four classes which were actually reached by the cruiser, are designated as marked trees.

During the period August 28, September 5 and October 5 and 7, 1918, the Kaweah project was carefully checked over with the purpose of finding out how many yellow pines and sugar pines were infested on the entire area subsequent to the spring 1918 control work. The checking was done by Messrs. J. M. Miller and A. Wagner of the Pacific Slope Station, and Messrs. Ralph Hopping and A.J. Jaenicke of the Forest Service. Not until the examination in the spring of 1919 will it be possible to get a full record of the trees which became infested during 1918 subsequent to the control work, because not until then will all of these " X trees" have changed the color of their foliage so that they can be easily found. The re-infestation found thus far on the Kaweah unit is as follows:

Species	Number of trees	Board feet
Yellow Pine	51	81,000
Sugar Pine	70	119,500
Jeffrey Pine	4	22,000

Progress of Yellow Pine Infestation Outside of Kaweah Unit.

For the interpretation of the progress of the infestation on the Kaweah unit after the spring of 1918 control work, it is necessary to follow the history of insect depredations in adjoining units which have not been disturbed by control work. For a proper understanding as to the degree certain natural influences for the increase or decrease of the infestation are or will be operative on the Kaweah project now that the initial control work has been done, and to better understand exactly to what extent the control work is responsible for the decline of the infestation, the measurement of properly selected check areas is essential.

Information is available from 6 infestation units in the same general region as the Kaweah. For three of these only the 1916 and 1917 losses are available, and for the other three the 1917 and 1918 figures are at hand. The Sequoia Station check area in the following table consists of 1200 acres within a timbered watershed and does not therefore comprise an entire unit. This check area was originally chosen as the uncontrolled infestation, the progress of which was to be compared with that of the Kaweah control project. The field work in September, 1918, demonstrated to all three authors of the Conference Plan that because of its small area and its location with reference to the Kaweah, that it did not register, even in a general way, the insect loss fluctuations in the surrounding areas. A more satisfactory check area must therefore be chosen, and it seems that the Paradise Ridge portion of Unit 8 has the desired requisites of a permanent check area, especially since it is in such an inaccessible portion of the Sequoia National Park that it is not apt to be disturbed for some years to come. The Marble Fork and Cactus Creek

areas, units 11 and 12 respectively, could be used as check area were it not for the fact that it is very likely that the Sequoia National Park will institute control measures on them in the very near future.

The figures given in the following table show clearly that the D. brevicomis infestation in yellow pine is increasing throughout the region in which the Kaweah control project is located, with the single exception of the Sequoia Station area, explanation of which has already been made.

Annual Loss in Yellow Pine.

	Volume in board feet			Percentage
	1916	1917	1918	Increase or Decrease
Sequoia Station		101,000	33,000	-68
*East Fork of Kaweah (Unit 9)		329,000	457,000	+ 38
*Salt Creek (Unit 9)		117,000	155,000	+ 32
Marble Fork (Unit 11)	50,000	165,000		+ 230
Cactus Creek (Unit 12)	25,000	89,000		+ 256
Kings Canyon (Unit 10)	40,000	187,000		+ 375

* Figures are only approximate estimates based upon extensive reconnaissance data.

Percentage of the Infested Volume Removed.

It has already been made clear that because of the difficulty of access and the labor shortage, no control work whatever was done on 40% of the area of the Kaweah unit. It was on this unworked area that the heaviest sugar pine infestation occurred, and since the chief investigative value of this project lies in watching the progress of the yellow pine insect losses, the fact that this portion of the unit was not worked, does not detract seriously from its value as a yellow pine study.

Prior to a statement of the actual volumes treated and left on the unit, a brief summary of the distribution of the infestation on the entire unit would enable a better understanding of what the control work actually accomplished in the removal of the infested timber.

In the following table the infested volumes consist of timber containing Dendroctonus beetles at the time of the control work in April, 1918. These trees had been attacked the previous fall and the control work was instituted before the emergence of the beetles in the spring of 1918. In the table they have been designated as " A trees." The infested volumes on the 40% of the unit which was not worked have been separated from the infested volumes in the worked area. In the untreated timber the marked trees and the spotted trees have been kept separate for the purpose of future comparisons. The marked trees are those which were actually blazed, numbered and measured, while the spotted trees were located by means of field glasses and their volumes estimated.

Distribution of Infested Trees.

	Yellow Pine				Sugar Pine			
	Isolated		Groups		Isolated		Groups	
	No.trees	Volume	No.trees	Volume	No.trees	Volume	No.trees	Volume
1. On area covered by control work.								
Treated trees	51	152,060	36	57,520	27	126,390	18	42,630
Untreated trees								
Marked trees	7	26,740	7	5,410	16	52,170	3	1,820
Spotted trees	1	2,410			6	22,470		
	59	181,200	43	62,940	49	207,030	21	44,450
2. On area not covered by control work:								
Untreated trees								
Marked trees	16	41,700	8	30,290	19	69,900	11	25,770
Spotted trees	12	28,920	3	7,250	11	41,195	2	7,490
	28	70,620	11	37,520	30	111,095	13	33,260

Total Infestation for Entire Unit.

	Yellow Pine		Sugar Pine	
	No.trees	Volume	No.trees	Volume
1. Treated trees	87	209,580	45	169,020
2. Untreated trees				
On area covered by control work	15	54,560	21	82,460
On area not covered by control work	39	108,140	43	144,355
Total	141	352,280	109	395,835

The percentage of the infested pine volume which was removed, given separately for that part of the unit which was worked, and then for the entire unit including both the worked and unworked area, is given in the following tabulations:

Ratio Between Treated and Untreated Volumes.

	On Worked Areas Only		On Entire Unit.	
	Yellow Pine	Sugar Pine	Yellow Pine	Sugar Pine
Infested Volume	244,140	251,480	352,280	395,835
Treated Volume	209,580	169,020	209,580	169,020
Untreated Volume	34,560	82,460	142,700	224,815
Per Cent treated	85.8	67.2	59.6	42.7

Conclusions.

Definite results from the Kaweah insect control project will not begin to be available until the elapse of another year or two. Thus far the chief value of the project has been that it has brought about a standardization in the methods of gathering field data, and the compilation of these data. This is a big advance, for it makes possible the gathering of such data on such future administrative projects which seem to be suited, in addition, for investigative purposes, with the minimum outlay of additional work and the minimum amount of difficulty in the interpretation of the data. Further, the standardization has resulted in such simplification that any one of the three authors of the Ashland Conference Plan can collect the necessary investigative data on any project independently of each other, and compile it so that the results will be clear and intelligible to the other authors of the plan. For future investigative work on insect control projects on the Pacific slope, this standardization and simplification in the collection and compilation of field data is of inestimable value.

Study of the Area in 1919.

In the spring of 1919, not earlier than May 15 and not later than June 1, a re-examination of the Kaweah unit, and such check areas as are considered necessary for the proper interpretation of the progress of the infestation on the Kaweah unit, should be undertaken. As has already been indicated the check areas thus far chosen to be used in connection with the Kaweah are not altogether satisfactory.

The Paradise Ridge yellow pine stand to the southeast of the Kaweah project was covered by insect surveys in 1917 and 1918, and seems to be fairly well adapted as a check area. The Paradise Ridge area should therefore be cruised in the spring of 1919, immediately after the examination of the Kaweah project.

It was possible in 1918 to go so far with the standardization of the collection of the field data and its subsequent tabulation, that it is not considered necessary for all three authors of the Ashland Conference Plan to take part either in this 1919 work or in the working up of the data.

Kings River Canyon Project.

This area, designated as unit 18 in the 1917 California Insect Survey, consists of 3000 acres of yellow pine and sugar pine in the floor of the Kings River Canyon. The floor is nine miles long and varies in width from one-half to one mile. Two full sections or 1280 acres of this timber has been under careful observation since 1916. Beginning with that year all infested trees have been marked and numbered, and as a consequence there are now available three years of careful records on the progress of the insect losses on 1280 acres of the canyon.

In the fall of 1918 all of the insect loss of 1917 and 1918 in the remaining 1720 acres of the canyon was marked and measured by Messrs. Hopping and Jaenicke of the Forest Service by methods which had been previously approved by J. M. Miller of the Bureau of Entomology.

The progress of the infestation in the canyon, both on the so-called check area of 1280 acres and the remaining 1720 acres, is indicated by the following loss summaries in which the sugar pine and yellow pine have been combined.

Check Area (1280 acres)

Year	No. of trees	Board feet
1916	48	40,200
1917	157	190,800
1918	170	214,850*
Three years' loss------	375	445,850

Remainder of Canyon (1720 acres)

1917	79	142,550
1918	100	140,150*
Two years' loss-----	179	282,700

* Some fall loss of 1918 is still to be added to these figures.

These losses are occurring in the finest and largest yellow pine and sugar pine in the Canyon, and since the Canyon is so limited in extent and has such large possibilities from the recreational standpoint, insect control work in the Canyon seems fully justified, aside from the unusual opportunities which the Canyon affords, from the investigative standpoint. In the annual insect report for 1918, the San Francisco office of the Forest Service has asked for an allotment of $1200 for insect control work in this Canyon.

Because of the large extent to which the Kings River Canyon infestation is isolated from other infested pine stands, and because of the large amount of accurate data already available on insect conditions in the unit during the past three years, control work in the Canyon will within a few years yield information of much value in the carrying out of other insect control projects in yellow pine and sugar pine stands of California.

The unit has its greatest value as an Area B under the Ashland Conference Plan by which it is proposed "to determine the extent of a sphere of influence, or what constitutes an infestation unit best suited for control operations."

If funds for the control work are allotted by the Forester, Messrs. Miller, Hopping and Jaenicke are agreed that the aim of the work should be to clean out the upper end of the Canyon and extend the control operations as far down the Canyon as possible and still leave a portion of the active infestation in a wide part of the Canyon floor.

Certain special features of the project after the initiation of the original control work in the spring of 1919 may require an additional

$400 during the summer of the same year. It is the plan of the San Francisco Office to ask for this additional amount in a supplementary recommendation.

The control work and the subsequent checking on the Kaweah project has made it possible to standardize the collection of the necessary investigative data to such an extent that the participation of Forest Examiner Jaenicke of District Six in the control work on the project in the spring of 1936 and the checks to be made subsequently is not necessary.

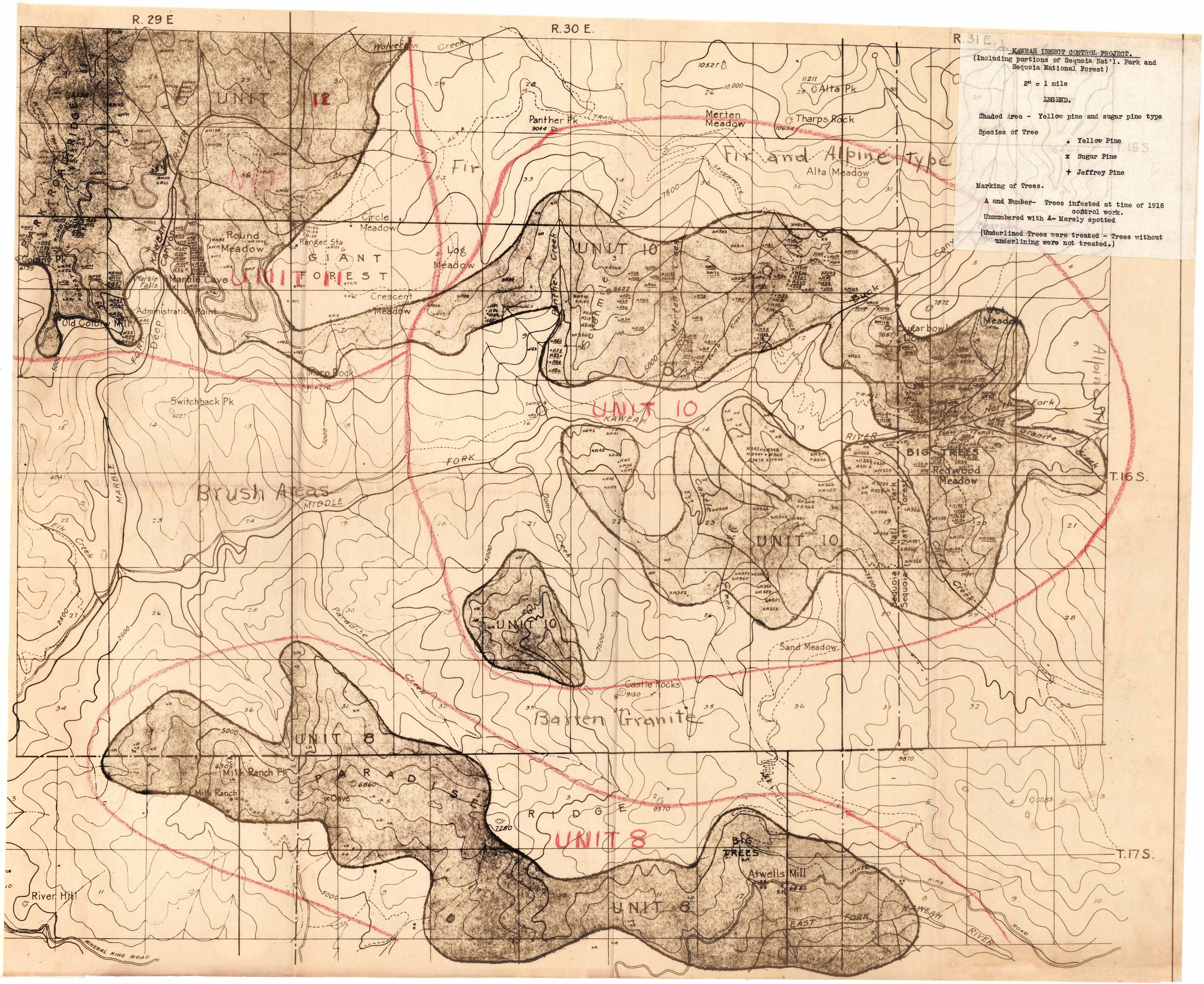
The Kings River Canyon unit is therefore recommended by the Pacific Slope Station of the Bureau of Entomology and Districts Five and Six of the Forest Service as an Area B under the Ashland Conference Plan.

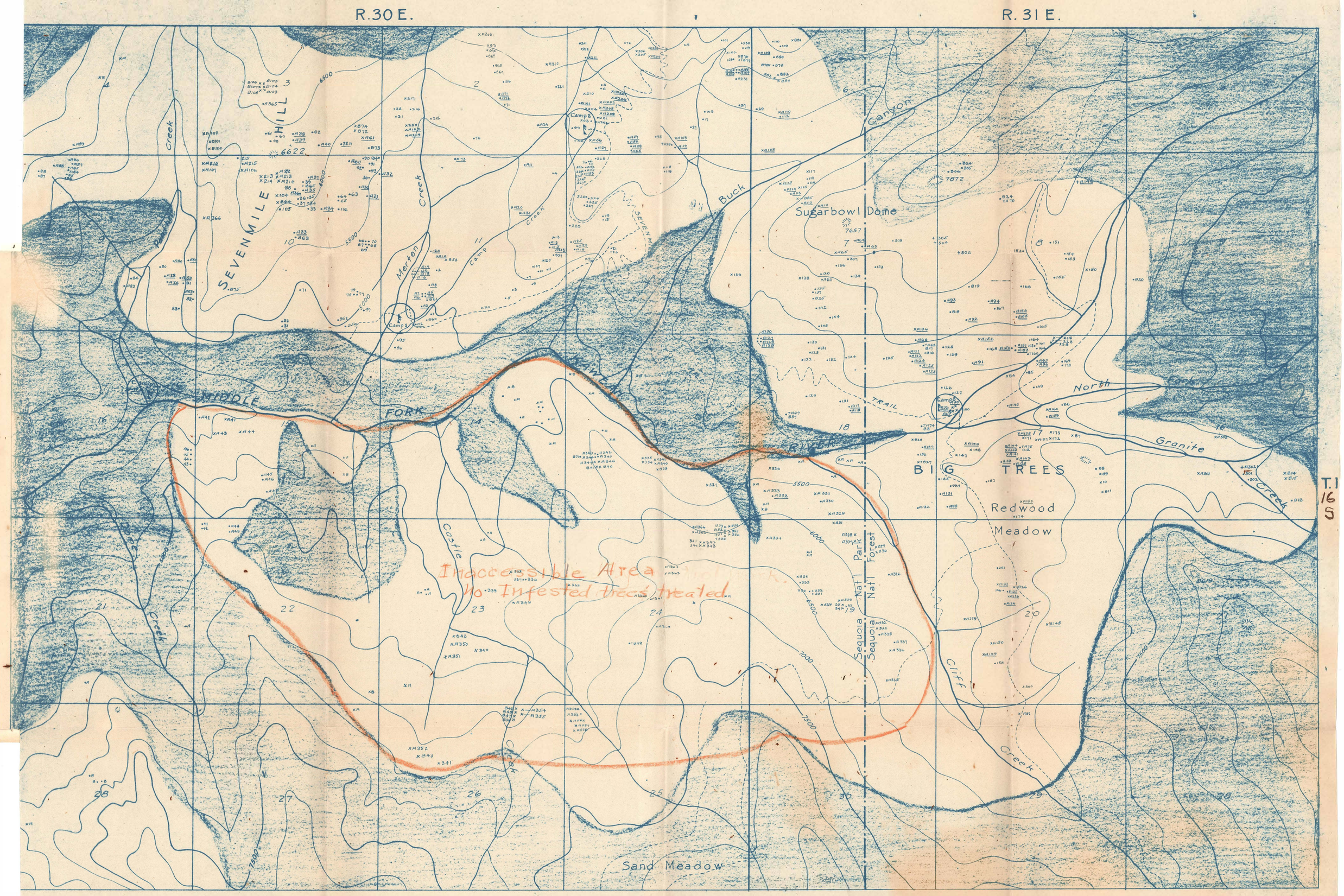
Recommendations.

1. That the Kings River Canyon project be approved by the Forester and an allotment of $1200 be set aside for the control work on this area, together with an additional provisional allotment of $400 to be used for supplementary work in Kings River Canyon immediately subsequent to July 1, 1919.

2. That opportunity be provided by the Forest Service and the Bureau of Entomology for the re-examination of the Kaweah project and appurtenant check areas in the spring of 1919 by the Pacific Slope Station and Mr. Hopping. As explained in the body of this report, similar study is necessary of the Kings River Canyon project, if money for the control work is allotted.

3. That because of the standardization of methods of collecting and compiling field data in Conference Plan projects effected by all three authors of the Conference Plan, that Forest Examiner Jaenicke's participation in the above outlined field work in California during 1919 be not insisted upon, as it is agreed that Jaenicke's share in the 1919 work on the Ashland Conference Plan should consist largely in an effort to locate infested areas in District Six, particularly monticolae attacks in yellow pine, which can be adopted as Conference Plan projects.


KAWEAH INSECT CONTROL PROJECT.
(Including portions of Sequoia Nat'l. Park and Sequoia National Forest)
2" = 1 mile
LEGEND.
Shaded Area - Yellow pine and sugar pine type
Species of Tree
• Yellow Pine
x Sugar Pine
+ Jeffrey Pine
Marking of Trees.
A and Number- Trees infested at time of 1918 control work.
Unnumbered with A- Merely spotted
(Underlined Trees were treated - Trees without underlining were not treated.)
R. 29 E
R. 30 E.
R. 31 E.
T. 15 S.
T. 16 S.
T. 17 S.
UNIT 12
UNIT 11
UNIT 10
UNIT 8
Fir and Alpine Type
Fir
Brush Areas
Barren Granite
GIANT FOREST
BIG TREES
PARADISE RIDGE
Panther Pk
Merten Meadow
Alta Pk
Tharps Rock
Alta Meadow
Circle Meadow
Round Meadow
Ranger Sta
Log Meadow
Crescent Meadow
Colony Pk
Marble Falls
Marble Cave
Administration Point
Old Colony Mill
Moro Rock
Switchback Pk
Sugarbowl Dome
Wet Meadow
Redwood Meadow
Sand Meadow
Castle Rocks
Milk Ranch Pk
Milk Ranch
Cave
Atwells Mill
River Hill
Wolverton Creek
Panther Creek
Merten Creek
Buck
Kaweah River
North Fork
Granite Creek
Middle Fork
Marble Fork
Deep Creek
Elk Creek
Paradise Creek
East Fork
Mineral King Road
Alta Trail
Seventmile Hill
Park Ridge Road
Sequoia Nat'l Park
Sequoia Nat'l Forest



SPECIES OF TREES.

- • Yellow pine.
- × Sugar pine.
- + Jeffrey pine

MARKING OF TREES.

Number only - trees abandoned prior to 1918 control work.
A and number - trees infested at time of 1918 " "
B " " - trees attacked subsequent to 1918 " "
Unnumbered with or without A or B - merely spotted.
(Underlined trees were treated and trees without underlining were not treated.)

EXAMPLE.

A31 - marked 1917 yellow pine, not treated.
A45 - treated 1917 sugar pine.
.B - yellow pine tree attacked subsequent to control work, and spotted only.

Unit 10

KAWEAH INSECT CONTROL PROJECT

(Including portions of Sequoia Nat'l Park and Sequoia Nat'l Forest)

Scale 4 in. = 1 mile

Contour Interval 500 ft.

Un-shaded Area - Yellow pine and sugar pine timber.